

# A U S H A N G

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## FREIE UNIVERSITÄT BERLIN

Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

# DISPUTATION

**Montag, 19. Januar 2026, 10:00 Uhr**

**Ort: Seminarraum 108/109**

**(Fachbereich Mathematik und Informatik, Arnimallee 3, 14195 Berlin)**

**Disputation über die Doktorarbeit von**

**Matei Sever Hanu**

**Thema der Dissertation:**

**Analysis of Numerical Methods for Ensemble Kalman Inversion and Filtering**

**Thema der Disputation:**

**An introduction to Physics-Informed Neural Networks with Uncertainty Quantification.**

Die Arbeit wurde unter der Betreuung von **Prof. Dr. C. Schillings** durchgeführt.

**Abstract:** Physics-Informed Neural Networks (PINNs) provide a flexible framework for solving partial differential equations by embedding physical laws directly into the training of neural networks. Instead of relying only on labeled data, PINNs enforce governing equations, boundary conditions, and initial conditions through automatic differentiation and residual minimization. This enables an easier integration of sparse data with physical models and has led to successful applications in forward and inverse problems across science and engineering.

In this talk, we first discuss the basic formulation of PINNs as introduced in Raissi et al (2017). We then present the Bayesian extension of PINNs, based on its first introduction in Yang et al (2021), where network parameters are treated as random variables and posterior distributions are inferred using variational or sampling-based methods. Bayesian PINNs enable uncertainty quantification in both the solution and inferred physical parameters, providing a probabilistic perspective that is particularly relevant for noisy data and inverse problems. Finally, we briefly discuss known limitations and open challenges of PINNs and Bayesian PINNs.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

**Interessierte werden hiermit herzlich eingeladen**

Die Vorsitzende der Promotionskommission  
Prof. Dr. C. Schillings